

## 7.—ECOLOGICAL NOTES ON THE VEGETATION OF 80-MILE BEACH.

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The area with which this paper is concerned is the portion of the coast of Western Australia between Cape Keraudren, where the No. 1 Rabbit Proof Fence reaches the coast and Cape Mississey, which marks the northern boundary of Anna Plains Station, and is the first break in the coastline of the beach. The ecological notes were obtained during a series of collecting trips through the area during July, 1941. They cover the country to a depth of from ten to fifteen miles. On an accompanying map the junction between the two main soil types is marked, since it is also the junction between the main ecological zones. The country north of Anna Plains has not been seen by the author. The vegetation of the portion of Pardoo, south of the Rabbit Proof Fence, is complicated by creeks inland and by mangrove swamps on the coast. Ecologically it is a transition region between the 80-Mile Beach and the country along the De Grey River, which is dealt with elsewhere.

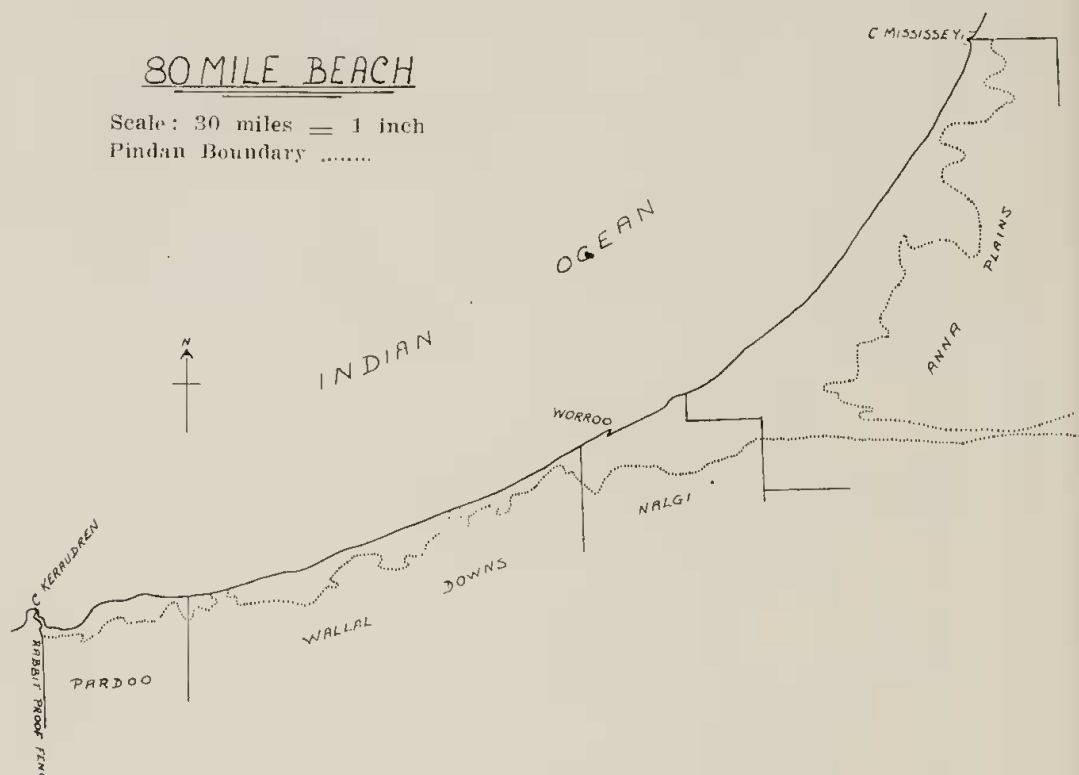
The climatic conditions are semi-arid. The annual precipitation varies between twelve and fourteen inches for the area. Most of the rain falls during the period December to March and owing to the porous nature of the soil the water soon disappears. Permanent water holes, except for a few small native soaks, are absent. There is a marked winter drought.

### PHYSIOGRAPHY AND SOILS.

The beach faces north-west or north-north-west in a long slow curve. It is without important features throughout its length. At Wooroo Creek there is a sharp but small indentation which includes a small mangrove swamp. Elsewhere the beach is unbroken. Wooroo Creek extends inland for about a mile. Behind the beach are series of sandhills varying from one to three miles in depth. The first row of the series are of normal dune type, both with and without vegetation. The sand here is very like that of the beach. Inland are sandhills carrying a different form of vegetation. The soil of these contains more organic material and is a light grey in colour compared to the creamy white beach sand. Some of the ridges have outcrops of a sandy limestone which, from the nature of its shell content, is of very recent character. Through the section included in Pardoo, Wallal, and Nalgi the sandhills dominate the coastal plain. Intermixed with them, however, are wide flats with a light grey loam soil. Through the Nalgi area these gradually increase in relative importance until in Anna Plains, where the coastal plain widens out, the loam flats are the main feature of the landscape.

The junction between the coastal plain and the spinifex pindan is marked on the map. It is a very abrupt change from the grey soils of the plain into the red desert sand. The vegetation also changes abruptly and the transitional phase occupies only a few yards. The spinifex pindan country is undulating or more or less flat with, in some places, long narrow sandhills running more or less parallel with each other and a varying distance apart. The only rock seen outcropping was a dark red ferruginous sandstone. Through Pardoo and Wallal the outcrops form small hills but on Anna Plains they result in piles of stones a few feet above the surface.

Across Nalgi and the southern section of Anna Plains is a curious tall shrub zone. The zone varies from under a mile to several miles in depth. The zone has two features worthy of comment. Firstly, just south of the Nalgi boundary is an area with numerous "blowholes" from a few inches to several feet in diameter. The depth of these is unknown. From surface indications the limestone here appears to be different in nature from that of the coastal sandhills. Secondly, through the blowhole country there are a few short drainage channels. Apart from these the whole area dealt with in this paper is entirely lacking in defined water courses.



Small patches of this shrubland occur in some places on Wallal but there is not a continuous zone as there is further north. There is no other outcrop of blowhole limestone.

Other features of interest on the coastal plain are occasional red sand ridges. The soil appears to be intermediate in character between the pindan sand and the coastal type. The former has possibly been left there as a result of wind action. East or south-east winds are of almost daily occurrence over many months of the year. Such ridges are usually near the junction of the pindan and the plain. In some cases the ridges have outcrops of the coastal sandy limestone.

#### ECOLOGY.

As has already been said the area may be divided into two main zones, i.e., the coastal plain and the spinifex pindan. However, the whole region belongs in the great ecological region which stretches from the Ashburton River to the Fitzroy River. This area is nearly all spinifex country, i.e., species of *Triodia* R.Br. dominate the landscape. Along the 80-Mile Beach there are just the two phases of the ecological type to discuss. *Triodia pungens* R.Br. is the dominant species and often the only grass present. Various other grasses are important in different sections but they will be

discussed under their respective headings. The trees present are stunted and often contorted in appearance. Among the shrubs various species of the Malvaceae are conspicuous. The Leguminosae, particularly in the pindan, provide a number of shrubs and small trees. These latter are mostly species of *Acacia*.

The following spectra give a picture for the area and for the two zones. It will be seen that there is a large number of annual species. This is rather misleading since the quantity of each of these is small and some species were only observed once, i.e., at the time of collecting. Another feature is that nearly all species are confined to one or other of the zones.

	No. of Species.	M.	N.	Ch.	Il.	Th.	E.
Whole Area ..	192	15	28	9	8	37	1
Coastal Plain ..	65	11	12	17	9	49	—
Spinifex Pindan	131	16	34	5	8.5	34	1

#### A. Coastal Plain.

##### (a) Coastal Sandhills—

(i) Beach dunes.

(ii) *Triodia* sandhills.

##### (b) Loam Flats—

(i) Grass plains.

(ii) Samphire flats and claypans.

##### (c) Cadgibut Shrubland.

##### (a) Coastal Sandhills.

(i) The beach sandhills are of the normal sand dune type, similar to those seen elsewhere along the west coast of Western Australia. Those with plant growth have a covering of *Spinifex longifolius*. Other plants include *Ipomaea biloba*, *Euphorbia myrtoides*, and *Ptilotus villosiflorus*. This association, which is often almost pure *Spinifex*, seldom occupies more than the first row of the series of sandhills along the coast.

(ii) Included under this heading are all the other sandhills of the coastal area. They include stationary sandhills of dune origin as well as those whose inner core of limestone is apparent in outcrops. As has been said above these sandhills are the main feature of the plain throughout Pardoo, Wallal and Nalgi. The vegetation is dominated by the coastal form of *Triodia pungens*, which has long wiry leaves and a dense tussock habit. Near the coast there is a reed like grass, *Panicum* sp., mixed with the *Triodia*. This is less apparent further inland. There are also patches of *Acacia salicina* forming small thickets in the hollows between the sandhills.

On the ridges, where red sand has been deposited, various plants are present which, normally, are restricted to the spinifex-pindan country. These include *Bauhinia Cunninghamii*, *Acacia holosericea*, *Acacia translucens* and the form of *Triodia pungens* which is found in the desert. This last has shorter leaves and long trailing culms which are more resinous than those of the coastal form.

The general picture of the coastal plain is that of undulating sandhills with a covering of coarse tussock grasses and with small *Acacia* thickets in some of the hollows.



1. Coastal Plain showing the sharp junction with the Cadgibut Shrubland, Nalgi.

(b) Loam Flats.

(i) The grass plains are relatively unimportant until the Anna Plains country is reached. Elsewhere only odd patches occur between the sandhills. Also over a good deal of the area the native grasses have been replaced by the introduced species *Cenchrus ciliaris* (Buffel Grass). Most of the notes concerning the native grasses were made at Anna Plains where the flats have been grazed by cattle for some years. Whether there has been any floristic alteration as a result of the grazing it is not possible to say on the available information.

*Triodia pungens* is lacking from the loam soils. The grassland is a mixture of species and it would be difficult to say which is the most important. Species which do occur are *Eragrostis Dielsii*, *E. lucunaria*, *Xerochloa barbata*, *Enneapogon planifolius*, *Sporobolus actinocladius*, *Triraphis mollis*, *Dichanthium humiliss*, *Chloris ruderalis*, *Panicum decompositum* var. *scaberrimum* and also *Sporobolus virginicus* which has two growth forms. As Salt Grass it forms a coarse mat 8-12 inches thick of erect culms while as Coastal Couch grass it has long trailing culms often more than twelve feet in length. The two forms appear to be the result of a response to a slight alteration in soil mineral salt content.



On what appear to be damper patches in the grassland there are colonies of *Eulalia fulva* or *Bothriochloa decipiens* (both known as Bundle Bundle Grass) with *Panicum decompositum* as a subdominant form.

As a rule the grass flats are treeless areas but occasionally there are small groups of *Melaleuca leucadendron* and *M. lasiandra* (Cadgibut). Here, as a rule, most of the grasses are absent, though *Cenchrus ciliaris* may occur. These tree groups represent isolated patches of the Cadgibut shrubland facies which forms a definite phase in the transitional zone between the coastal plain vegetation and that of the spinifex pindan. This border type appears not only where the junction is between loam and red sand but also where it is between grey and red sand.

(ii) Samphire flats and claypans occur in the sand hill country as well as on the grass flats. The soil is grey loam. Since there is no proper drainage system the loam flats are the only places where one would expect water to lie after rain. Tracks through these flats have a sinister reputation for their mud during the wet season. It seems likely that the soil here has a slightly higher concentration of mineral salts. If this is so it explains the zonation which can be observed. There are three zones. In the outer one *Sporobolus virginicus* (Salt Grass form) is dominant and there may be colonies of *Trianthema turgidifolia*. Other plants which have been collected in this zone include *Trichinium exaltatum* and *Scaevola spinescens*. In the next zone *Trianthema turgidifolia* has become dominant. Mixed with it are *Bassia astrocarpa* and *Atriplex elachophylla*. In some places either of these zones may carry small thickets of *Acacia bivenosa* or *Acacia salicina*, but otherwise trees and shrubs are completely lacking on the samphire flats. *Trianthema turgidifolia* is locally known as yellow samphire. The third zone sees *Trianthema turgidifolia* replaced by *Arthrocnemum Bentharii* (Red or Black Samphire). This species gradually thins out until the bare ground of the centre is reached.

A good example of samphire flat is seen at Wooroo Creek between the sandhills. The portion near the creek, which has a border of mangroves, is flooded at certain times of the year when there are exceptionally high tides. Over this portion *Trianthema* is replaced by *Arthrocnemum Bentharii*.

#### (c) Cadgibut Shrubland.

This section represents a peculiar development of the coastal plain. Various species of *Melaleuca* are abundant and dominate the vegetation. This is in striking contrast to the almost treeless plain. The soil is grey loam as on the flats. The species of *Melaleuca* present are *M. leucadendron*, *M. alsophila* and *M. lasiandra*. This association is found along the Nalgi frontage between the plain and the spinifex pindan. In the southern section of Anna Plains it turns eastwards and is lost in the desert. On Wallal isolated patches of similar country are found in a similar situation, but there is no distinct sub-zone.

Apart from the *Melaleuca* trees (up to 15 feet high) the vegetation is very much the same as on the samphire flats. However occasional patches of *Triodia pungens* of the plains form are to be seen, especially where small sand drifts have formed under the trees. The local impression was that *Trianthema turgidifolia* had replaced *Sporobolus virginicus* during the grazing of the years of occupation. However, since the former can withstand

higher concentrations of mineral salts, one must hesitate before placing all the responsibility of such a change on to the biotic factor. It is equally possible that climatic cycles may be an important factor.

In the northern part of the shrubland cadgibuts are replaced by *Acacia salicina* and *Acacia bivenosa*. Small drainage channels in this country are bare of vegetation and meander through the samphire for a mile or so.

Throughout this shrubland stock water can be obtained at no great depth. Wooroo Well on the Stock Route and about three miles inland from Wooroo Creek is an example. When visited in July the water level in this well was about twelve feet from the surface. This well is on the site of an old aboriginal soak. Other wells in the zone vary in depth but no figures are available. On the coastal plain, ground water is commonly too salt for stock while in the spinifex country the water though deeper down is, in most cases, classed as "good stock water."

### B. *Spinifer* Pindan.

The name "spinifex" is used locally for all species of *Triodia*; "pindan" is a native word which is used for the desert country by the pastoralists. This zone can be subdivided as follows:—

- (a) Transitional phase
- (b) *Triodia* phase.
- (c) *Plectrachne* phase.

(a) The transitional phase is particularly clear along the Anna Plains frontage. It commences with a line of *Melaleuca* trees on the edge of the treeless grey loam plain. The ground flora includes small annuals such as *Sporobolus australasicus* and *Eragrostis Dielsii* with occasional bushes of *Trianthema turgidifolia*. Where the loam changes to the red sand the flora also changes and *Eragrostis eriopoda*, *Crotalaria Cunninghamii*, and *Polanisia icosandra* replace the above mentioned species. This phase gives way to a dense zone of *Melaleuca lasiantha* and *Acacia translucens*, which are both shrubs about three to five feet high, with occasional clumps of *Triodia pungens* and *Eragrostis eriopoda*. After this the cadgibuts disappear and the area can no longer be classed as transitional.

There are certain variations of the transitional phase. In some places there is a band of *Acacia salicina* in others the *Acacia translucens* band is missing. The change-over is narrow and the transitional phase may only be ten or 15 yards in depth. In other places it extends up to 50 but this is not often.

(b) and (c) The spinifex pindan has two definite phases. In the first the pindan form of *Triodia pungens* is associated with a stunted form of *Bauhinia Cunninghamii*. In the second *Triodia* is replaced by a similar grass *Plectrachne Schinzii* and *Bauhinia* is replaced by small trees such as *Dolichandrone heterophylla* and *Eucalyptus zygomphyla*.

The first of these phases is the nearer to the coast. Its inland boundary is not very definite and the phase varies in depth. The *Plectrachne* country apparently runs out into the desert proper. It extended inland as far as the author travelled, i.e., to a distance of fifteen miles from the coast at Wallal. According to report it extends along the Rabbit Proof Fence at least as far as the 121 degree meridian.



II. *Spinifex pindan* showing the association of shrubs and tussock grasses. *Acacia holosericea*, *A. tumida* and *Plectrachne Schinzii*.

Both phases of the pindan carry various species of *Acacia*. These, except in the case of *Acacia translucens* which grows about two to three feet high, are all small trees. They commonly form thickets in which only one species is represented. The commoner species are *A. tumida*, *A. holosericea*, *A. trachycarpa*, *A. pachycarpa*, *A. coriacea*, *A. impressa* and *A. stipuligera*.

In marked contrast to the coastal plain are the number of shrubs which are associated with the perennial tussock grasses. They include the following: *Abutilon Walcottii*, *A. indicum*, *Sida lepidota*, *S. spinesca*, *Calythrix interstans*, *Halgania littoralis*, *Pimelea ammodaridensis*, *Adriana tomentosa*, *Cyanostegia Bunyana*, and *Newcastlia cladotricha*. Larger forms are *Cassia glutinosa*, *C. Sturtii* var., *Clerodendron tomentosum*, *Gardenia Pantoni* and *Duboisia Hopwoodii* and *Stylobasium spathulatum*. Members of the Proteaceae are not numerically important. They include *Grevillea pyramidalis*, *G. refracta*, *G. agrifolia*, *Hakea macrocarpa* and *Persoonia falcata*. There are many slender shrubs belonging to the Leguminosae. Eucalypts are not well represented. In most places they are completely lacking from the *Triodia* phase while in the *Plectrachne* country they gradually appear more often as one goes farther inland. They either form small mallee clumps or develop into small trees from ten to fifteen feet high. The species are *Eucalyptus zigophylla* and *E. dichromophloia*.

Plants of *Eragrostis eriopoda* are often seen amongst the *Triodia* tussocks. This grass is the most important species after *Triodia* and *Plectrachne* since it replaces both when they are destroyed and prevented from recovering through seedling development. Normally *Eragrostis eriopoda* is present in the association as a minor constituent.

Other grasses present are *Amphipogon strictus*, *Chrysopogon pallidus*, *Cymbopogon bombycinus*, *Digitaria Brownei*, *Digitaria ctenantha*, *Panicum cymbiforme*, *Ichnanthus australiensis*, *Setaria surgens*, *Aristida arenaria*,



*Enneapogon pallidus*, *Eriachne pulchella* and *Sorghum plumosum*. None of these grasses is an important constituent.

The further one penetrates into the desert the more numerous become the long sand ridges. These, presumably, are similar to those described by Warburton (1875) and Carnegie (1898) in the country to the east. General observations suggested that the *Acacia* thickets grew between the ridges or in open country while small plants of *Bauhinia Cunninghamii* and small trees such as *Owenia reticulata* and *Hakea macrocarpa* grew on the ridges.

#### SUMMARY.

An attempt has been made to describe the vegetation of the coastal strip between Cape Keraudren and Cape Mississey. It has been shown that there are two well defined ecological zones which are associated with certain soil differences.

On the coastal plain the biotic factor has been responsible for the introduction of *Cenchrus ciliaris* (Buffel Grass) especially on loamy soils. In the desert country no introduced plant has as yet succeeded in establishing itself but where the normal tussock grasses are lost they are replaced by the native species *Eragrostis eriopoda*.

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